

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Patent Application of Day et al	:	
	:	
Serial No.	:	Art Unit 1733
	:	
Filed:	:	Examiner J. Aftergut
	:	
Title:	:	Confirmation No. 1504
	:	
<b>SELECTIVELY ROUGHENING</b>	:	
<b>CONDUCTORS FOR HIGH</b>	:	
<b>FREQUENCY PRINTED WIRING</b>	:	
<b>BOARDS</b>	:	

Atty. Docket No. END920010118US2 (IEN-10-5625-D1)

**APPEAL BRIEF**

Mail Stop Appeal Brief - Patents  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

**I. REAL PARTY IN INTEREST**

The real party in interest in the above-entitled application is International Business  
Machines Corporation of Armonk, New York.

**II. RELATED APPEALS AND INTERFERENCES**

The undersigned attorney is not aware of and, on information and belief, neither the  
appellants nor the assignee is aware of, any related appeals or interferences which would directly  
affect, or be directly affected by, or have a bearing on the Board's decision in this pending appeal.

### **III. STATUS OF THE CLAIM(S)**

Claims 1 and 3-15, all of the claims in the application, have been finally rejected. No claims have been allowed.

### **IV. STATUS OF AMENDMENTS**

All proposed amendments have been entered, so no issues as to entry of amendments are present.

### **V. SUMMARY OF THE INVENTION**

It has been found that roughening of the conductors on the printed wiring board structure is critical only in certain regions and not required for the entire length of each of the circuit traces or signal lines. In fact, the mechanical and chemical exposures are greatest where a signal or power plane intersect a plated through hole. Therefore, the need is greater for good copper to laminate adhesion at this intersection than in the open, non-drilled areas of the board. Thus, according to the present invention, a printed wiring board is formed from two or more layers **10**, **12** of dielectric material, one of which **10** has circuit lines or traces **14** formed thereon, and wherein the surfaces of the circuit lines or traces are selectively roughened, i.e. the lands **16**, as shown at **25** only in those areas that require very good copper to laminate adhesion, whereas the remainder of the surface of the circuit lines or traces **14** is maintained in essentially a smooth condition **18**. This provides a good solution to the conflicting needs for good adhesion and good signal propagation qualities since there is only a limited or relatively small area that requires very good adhesion, and these areas are generally so small that they do not materially affect the propagation of the signals on the signal lines. Thus, those critical areas for propagation of the signal on signal lines or traces can have the circuit lines or traces smooth to maximize the signal

propagation effect, while those limited areas where the signal propagation is not critical can be roughened so as to improve the adhesion of one layer to another. Therefore, in the resulting board, adequate adhesion can be obtained while still providing a significantly better signal propagation than is possible with the roughened conductor surface.

It has also been found that on the voltage planes (including power and ground planes) smoothing the surface of the voltage plane in those regions opposite the smooth surface regions of the signal planes improves the performance of the signal propagation. Thus, these limited areas of the voltage planes can be maintained smooth while the other areas of the surface of the voltage planes can be roughened, which provides the necessary adhesion of the voltage plane to the adjoining layer of dielectric material between the voltage plane and the signal plane.

In the case of both signal and voltage planes, the application of selective roughening is not necessarily dictated solely by the location of signal lines and plated through holes, but can be customized for a specific board design by balancing the electrical signal performance characteristics and mechanical requirements of that board. For example, one design may require smooth conductors on every signal line and the respective area of the reference planes, another design may prescribe smooth conductors on the signal lines only and not the reference planes, while still another may have only a few select number of signal lines requiring smooth conductors for optimum electrical performance, allowing all other conductors roughened for maximum mechanical adhesion.

Sticker sheet **13** is disposed between the signal layer **10** and the reference voltage layer **12** to which the signal layer **10** and reference voltage layer **12** are laminated by conventional means. The sticker sheet **13** is maintained in the B cured state (partially cured) for lamination, after which the laminate is fully cured. During drilling of holes at the composite level, opening

32 is formed through sticker 13 aligning with opening 17 in dielectric 15 and opening 28 in dielectric 27 so that a continuous through opening is provided. The openings 32, 29 and 17 provide the surface for plated through hole 33 which comprises copper plated onto the dielectric materials in a conventional manner. The land 16 is in contact with the copper 33 in the openings 17, 29 and 32 to provide for a signal path. The copper plating 33 includes annular collars on opposite sides of the laminate structure. (It is to be understood that the printed wiring board shown in Figures 1-3 is for illustrative purposes only and that several different layers could be, and typically are, stacked but the showing only of the layers 10 and 12 illustrates the present invention.)

## **VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

The examiner has rejected claims 1 and 3-15 (all of the claims pending in the application) as being unpatentable under 35 U.S.C. 103(a) over appellants' admitted prior art, hereinafter AAPA, in view of Japanese Patent 2000-68620, hereinafter 620, and Gerber et al, U.S. Patent 5,401,913, hereinafter Gerber et al. This rejection is not thought to be well taken.

## **VII. ARGUMENTS**

First, claim 1, upon which all of the other claims depend, directly or indirectly, requires a voltage plane as a sheet of foil disposed on a dielectric, and laminating the voltage plane to the signal plane with a sticker sheet therebetween. It is respectfully submitted that none of the prior art suggests this. With respect to Gerber et al, no voltage plane is shown in relationship to the signal lines, and the films of material 58, 24, 60 and 62 may be an anisotropically *conductive* adhesive (Column 6, lines 36-39). This is not a sticker sheet or a voltage plane.

And a sticker sheet is a dielectric material, page 7, lines 20-22. Since there is no voltage plane shown in the prior art, it cannot be oriented toward the signal plane. Thus, the references do not show or teach the invention as claimed.

Moreover, at the locations cited by the examiner of the 620 patent, namely paragraphs [0011], [0012] and [0065], it appears that the roughening of the lands is to obtain better connection of the lands to other conductive material.

“[0011] According to the 1<sup>st</sup> above-mentioned configuration, since the contact interface with the conductive constituent of a circuit pattern is roughened, a touch area increases and the dependability of connection improves according to the operation which the number of points of contact of the conductive filler in a conductive constituent and the metallic foil of a circuit pattern increases, or heightens adhesive strength of the resin and the circuit pattern which are contained in a conductive constituent.”

Since the translation furnished by the Patent Office was done by a machine, it is difficult to understand it completely. However, the English language version of the Abstract states as follows:

“PROBLEM TO BE SOLVED: To realize a circuit substrate having high reliability in inner via hole connection by a method wherein at least one of interfaces of a wiring pattern with a conductive component is roughened more than an interface with an insulator layer.” (Emphasis supplied)

Thus, it is clear that in appellants’ case, the roughening of the conductor is for adhesion to a *dielectric material*, i.e. the substrate or sticker sheet, not a *conductive material* as in the 620 patent. This function is clearly shown in the drawings, especially in Figures 1 and 2, and set out on page 2, lines 15-19 of the instant case:

“Thus, according to the present invention, a printed wiring board is formed from two or more layers, one of which has circuit lines formed thereon, and wherein the surfaces of the circuit lines or traces are selectively roughened only in those areas that require very good copper to laminate adhesion, whereas the remainder of the surface of the circuit lines or traces are maintained in essentially a smooth condition.” (Emphasis supplied)

The reasons for smooth and roughened surfaces are explained in detail on page 1, line 13, through page 2, line 13, of the instant application. None of these reasons apply to the art cited by the examiner and, thus, there cannot be any motivation to combine the references for roughening a surface for adhesion to a dielectric material.

It is not enough that one may modify a reference in view of a second reference, but rather it is required that the second reference suggest modification of the first reference and not merely provide the capability of modifying the first reference.

The CAFC stated in In re Piasecki, 745 F.2d 1468, 223 USPQ 785, 788 (Fed. Cir. 1984) the following:

“The Supreme Court in Graham v. John Deere Co., 383 U.S. 1 (1966), focused on the procedural and evidentiary processes in reaching a conclusion under Section 103. As adapted to ex parte procedure, Graham is interpreted as continuing to place the ‘burden of proof on the Patent Office which requires it to produce the factual basis for its rejection of an application under sections 102 and 103’. Citing In re Warner, 379 F.2d 1011, 1020, 154 USPQ 173, 177 (CCPA 1967).”

The law is quite clear that in order for a claimed invention to be rejected on obviousness, the prior art must suggest the modifications sought to be patented; In re Gordon, 221 U.S.P.Q. 1125, 1127 (CAFC 1984); ACS Hospital System, Inc. v. Montefiore Hospital, 221 U.S.P.Q. 929, 933 (CAFC 1984). The foregoing principle of law has been followed in Aqua-Aerobic Systems, Inc. v. Richards of Rockford, Inc., 1 U.S.P.Q. 2d, 1945 (D.C. Illinois 1986). In the Aqua-Aerobic's case, the Court stated that the fact that a prior reference can be modified to show the claimed invention does not make the modification obvious unless the prior reference suggests the desirability of the modification. The CAFC in the case of In re Gorman, 18 U.S.P.Q. 2d (CAFC 1991) held at page 1888:

"When it is necessary to select elements of various teachings in order to form the claimed invention, we ascertain whether there is any suggestion or motivation in the prior art to make the selection made by the applicant [citation]. 'Obviousness

cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting the combination' [citations]. . .

The references themselves must provide some teaching whereby the applicant's combination would have been obvious."

Further, the CAFC, in In re Oetiker, 24 U.S.P.Q. 2nd 1443, 1445 (CAFC 1992) held:

"There must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination. That knowledge can not come from the applicant's invention itself."

Most significantly, the CAFC in the case of In re Dembiczak, 50 U.S.P.Q.2<sup>nd</sup> 1614 (CAFC 1999) held at 1617:

"...(examiner can satisfy burden of obviousness in light of combination 'only by showing some objective teaching [leading to the combination]')"

Thus, it is clear that where an individual reference does not teach the entire invention, then the modification which the invention represents must be suggested and motivated by some other reference through some objective teaching and cannot come from the application itself, which is not the case here. The mere suggestion of selective roughening is not sufficient. Especially since it is at a different place for a different purpose

Claims 3-15 are dependent, directly or indirectly, on claim 1 and, for the same reasons, are believed to be allowable. Moreover, with respect to claims 3-5, there is nothing in the prior art to suggest any degree of roughness or smoothness of the signal plane, and there is no suggestion anywhere that the appellants' choices are desirable, or even appropriate. Thus, for this additional reason, claims 3-5 are believed to be allowable.

With respect to claims 8, 9 and 13-15, since there is no suggestion of a voltage plane as related to the signal plane, there is definitely no suggestion of areas of roughness and smoothness


and certainly not of that claimed in claim 9. Thus, for this additional reason, these claims are believed to be allowable.

**SUMMARY**

Therefore, in view of the foregoing, it is respectfully requested that the Board reverse the examiner, and allow claims 1 and 3-15.

Respectfully submitted,

Date: SEPTEMBER 29, 2006

  
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William N. Hogg , Reg. No. 20,156  
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WNH:cg

Attachments

## CLAIM APPENDIX

1. (Previously presented) A method of laminating a circuit board comprising the steps of:

providing a first layer having a dielectric material having a conductive signal plane thereon, said signal plane having at least one surface with a first portion having a first roughness;

forming said signal plane into signal lines and lands;

thereafter selectively roughening at least a second portion of said at least one surface including said lands, but less than all of said one surface, to form a second surface having a second roughness greater than said first roughness;

providing a second layer comprised of a voltage plane as a single sheet of foil disposed on a dielectric material; laminating said first layer to said second layer with a sticker sheet therebetween to form a composite structure; said signal plane and said voltage plane being oriented toward each other;

said composite structure being formed with plated through holes surrounded by said lands.

2. (Canceled)

3. (Previously presented) The invention as defined in claim 1 wherein said second roughness of said signal plane has an  $R_z$  value greater than about 3 microns.

4. (Previously presented) The invention as defined in claim 1 wherein the first roughness of said at least one surface of said signal plane has an  $R_z$  value of less than about 1 micron.

5. (Previously presented) The invention as defined in claim 1 wherein said first roughness of said signal plane has an  $R_z$  value less than about 1 micron, and said second roughness of said signal plane has an  $R_z$  value greater than about 3 microns.

6. (Previously presented) The invention as defined in claim 1 wherein said signal plane has a plurality of portions of said at least one signal plane surface with said second roughness.

7. (Previously presented) The invention as defined in claim 6 wherein said plurality of portions of said at least one signal plane surface includes at least three surfaces.

8. (Previously presented) The invention as defined in claim 1 wherein said voltage plane has a first portion with at least one surface with a first surface roughness aligned with the first portion of said signal plane, and a second portion having a second surface with a second surface roughness greater than the surface roughness of said first portion of said voltage plane.

9. (Original) The invention as defined in claim 8 wherein said first portion of said at least one surface of said voltage plane has an  $R_z$  value surface roughness of less than about 1 micron and said second portion of said second surface of said voltage plane has an  $R_z$  value of greater than about 3 microns.

10. (Previously presented) The invention as defined in claim 1 wherein said second portions of said signal plane having a second roughness are copper and are roughened by treating the copper surface with an oxide or an oxide replacement process, or having plated thereon zinc, brass, nickel or chrome.

11. (Previously presented) The invention a defined in claim 1 wherein said surface of said signal plane having said second roughness is created by applying a photoresist material to said signal plane, then exposing and developing said photoresist to reveal the surface to have said second roughness, then treating said surface to have said second roughness to provide the desired surface roughness, then removing the photoresist.

12. (Previously presented) The invention as defined in claim 1 wherein said second portion on said signal plane having said second roughness is created by,

applying a masking material to unmasked areas of said signal plane that are not to have said second roughness,

then roughening those areas to have said second roughness.

13. (Previously presented) The invention as defined in claim 8 wherein said second portion of said signal plane roughened surfaces having said second roughness and said second portion of said voltage plane having said second roughness are roughened by treating the copper surface with an oxide or an oxide replacement process, or having plated thereon zinc, brass, nickel or chrome.

14. (Previously presented) The invention as defined in claim 8 wherein said surface on said voltage plane having said second roughness is created by applying a photoresist material to said voltage plane, then exposing and developing said photoresist to reveal the surface to have said second roughness, then treating said to have said second roughness surface to provide the desired surface roughness, then removing the photoresist.

15. (Previously presented) The invention as defined in claim 1 wherein said second portion on said signal plane having said second roughness is created by,  
applying a masking material to unmasked areas of said signal plane that are not to have said second roughness,  
then roughening those areas to have said second roughness.

## **EVIDENCE APPENDIX**

No evidence has been entered.

## **RELATED PROCEEDINGS APPENDIX**

No related proceedings are known to appellants' attorney.